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EARTH SCIENCES

No. 2

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I. OCEANOGRAPHY

Abstracts of Scientific Articles

LOCAL STRUCTURE OF FIELDS OF DISSIPATION OF TURBULENT ENERGY

Moscow OKEANOLOGIYA in Russian Vol 19, No 5, 1979 pp 766-775

[Article by N. N. Korchashkin and I. D. Lozovatskiy, Institute of Oceanology, "Local Structure of the Fields of Dissipation of Turbulent Energy and the Rate of Evening-Out of Temperature Inhomogeneities in the Ocean"]

[Abstract] On the basis of measurements of small-scale pulsations of hydrophysical fields in different regions of the ocean it was possible to estimate the rates of dissipation of turbulent energy ϵ_u and the evening-out of temperature inhomogeneities ϵ_T , averaged for the small depth range 1-3 m. Using the results of these same measurements the authors were able to determine the spectral densities of fluctuations of velocity and temperature. It was found that in the case of existence of a distinct inertial-convective interval in the wave numbers the probability distribution functions of ϵ_u and ϵ_T fluctuations in the spectra of ocean turbulence, averaged for the range of scales belonging to this interval, conform to a log-normal law. This result can serve as a confirmation of the applicability of the conclusions drawn from the refined theory of local isotropy to well-developed ocean turbulence.

[95-5303]

FLUCTUATIONS OF LIGHT PARAMETERS IN SEA WATER

Moscow OKEANOLOGIYA in Russian Vol 19, No 5, 1979 pp 798-804

[Article by V. I. Burenkov, B. F. Kel'balikhanov and L. A. Stefantsev, Institute of Oceanology, "Fluctuations of the Attenuation and Scattering of Light by Sea Water"]

[Abstract] A theoretical study was made of fluctuations of the indices of attenuation and scattering of light by sea water (scattering in the disperse phase -- suspended particles -- is considered). The authors separately examine manifestations of fluctuations of these parameters in homogeneous

(Poisson fluctuations) and inhomogeneous (fluctuations caused by turbulence) media. Basic expressions are derived which describe the statistical properties of Poisson and turbulent fluctuations. The conditions under which different types of fluctuations predominate are analyzed. It is shown that small-scale turbulence in the ocean is an important factor causing fluctuations in the optical characteristics of sea water. A study of these fluctuations plays an important role for problems relating to the propagation of optical radiation in ocean waters. In addition, a study of fluctuations of optical characteristics can be useful for investigating turbulent processes in the ocean. An important advantage of optical methods is that they are contactless, which cannot be achieved when using ordinary methods.

[95-5303]

STATISTICAL DISTRIBUTIONS OF TEMPERATURE, SALINITY, DENSITY, SPEED OF SOUND

Moscow OKEANOLOGIYA in Russian Vol 19, No 5, 1979 pp 805-810

[Article by L. I. Galerkin, Institute of Oceanology, "Evaluation of the Interrelationship of Statistical Distribution of Temperature, Salinity, Density and Speed of Sound in the Northern Part of the Pacific Ocean"]

[Abstract] The article discusses the parameters of spatial statistical distributions of temperature, salinity, density and speed of sound in the northern part of the Pacific Ocean. The data were from about 30,000 oceanographic stations. All the observations were distributed in 5° grid squares. The mean values for the entire set (mathematical expectations), modal values (predominant) and extremal values were determined within each grid square. These values were mapped and the determined fields were statistically processed as a set of values in the same horizontal plane. The total number of grid squares exceeded 250 and the number of observations in each varied from 1 to several hundred. An evaluation of the interrelationship of statistical characteristics was made on the basis of the probability distribution curves for each of the enumerated fields, on the basis of the central moments of the distribution and also on the basis of the correlation coefficients of the modal and extremal fields with the means at the ocean surface, at 200 and 500 m. It was found that there is a similarity in the shapes of the distribution curves for the mean annual, long-term and extremal values. The correlation coefficients between them vary from 0.97 to 0.65. On the basis of a comparison of the spatial and temporal values of the standard deviations the conclusion is drawn that the spatial variability of the hydrophysical parameters is 3-5 times greater than the temporal variability.

[95-5303]

TEMPERATURE DEPENDENCE OF CONTENT OF LIQUID PHASE IN FROZEN SEA WATER

Moscow OKEANOLOGIYA in Russian Vol 19, No 5, 1979 pp 811-814

[Article by N. A. Mel'nichenko, V. I. Mikhaylov and V. I. Chizhik, Far Eastern State University and Scientific Research Institute of Physics at Leningrad State University, "Study of the Temperature Dependence of the Relative Content of the Liquid Phase in Frozen Sea Water by the Nuclear Magnetic Resonance Method"]

[Abstract] The nuclear magnetic resonance method was used in studying the temperature dependence of the relative content of the liquid phase Q_{liq} in sea ice in the temperature range -2° - -35°C . A temperature hysteresis of the Q_{liq} value was discovered at temperatures from -20° to -35°C . Hypotheses concerning the reasons for the appearance of the hysteresis are expressed. The sample used was sea water with a salinity of 34.98‰ taken from the surface in the Atlantic in the winter of 1977. The data indicate that the greatest changes occur at a low temperature (to -5°C) and then in the interval from -22 to -30°C . The authors show that the pulsed nuclear magnetic resonance method can be used for the speedy analysis of sea ice samples for its content of the liquid phase at sea because the spin-echo spectrometer, based on semiconductor radio components and microcircuits, is compact in size. The registry of free nuclear induction signals in the earth's magnetic field is also a possibility. In this case it is possible to obtain signals from the liquid phase present in thick ice layers. In contrast to the usual method for registry of nuclear magnetic resonance the sample is not placed within a receiving coil but surrounds it on all sides. In this method the analysis is made by a contactless method and it is possible to repeat the experiment with the same sample when there is a change in temperature and pressure.

[95-5303]

NEW MULTICHANNEL SPECTROPHOTOMETER

Moscow OKEANOLOGIYA in Russian Vol 19, No 5, 1979 pp 911-918

[Article by I. I. Gitel'zon, A. P. Shevyrnogov, S. L. Molvinskikh, V. V. Chepilov, N. D. Karayev and M. B. Psakhis, Physics Institute Siberian Department USSR Academy of Sciences, Krasnoyarsk, "MKS-12 Field Multichannel Spectrophotometer"]

[Abstract] The MKS-12 multichannel spectrophotometer is described. A photograph shows the external appearance of the instrument and a functional diagram is presented and serves as the basis for the textual description of the instrument (the diagram shows 25 components). The instrument makes it possible to register the coefficients of spectral brightness of natural objects in 12 intervals of the visible part of the spectrum from aboard

moving carriers. The MKS-12 is coupled to an automated system for the collection and processing of data on the basis of use of a minicomputer. The technical specifications of the instrument are as follows: angle of spectrometer field of view 1° ; relative aperture of entrance objective 1:1; focal length of objective 90 mm; number of spectral channels 12; region of spectral response -- visible; width of transmission bands in used light filters 0.4 nm ($\tau_{\max} = 12$ nm); maximum transmission coefficient $T_{\max} = 20-40\%$. The photodetector used was an FEU-79 photomultiplier with spectral response in the region 300-830 nm. Scanning time in the spectrum was 1.5 sec. The error in reproducing the instrument readings, computed on the basis of laboratory measurements, was not greater than 1%. The instrument underwent successful testing during the 18th voyage of the research ship "Dmitriy Mendeleev." During the day, while the vessel was underway, continuous measurements were made of the spectral brightness coefficients for a distance of more than 9,000 miles under different climatic conditions. These sea tests demonstrated the high effectiveness of the MKS-12 in combination with an automated system for the collection and processing of optical information on shipboard.
[95-5303]

EFFECTIVENESS OF PNEUMATIC SOUND SOURCES IN DEEP SEISMIC SOUNDING

Moscow OKEANOLOGIYA in Russian Vol 19, No 5, 1979 pp 919-922

[Article by Yu. P. Neprochnov, I. N. Yel'nikov and B. N. Grin'ko, Institute of Oceanology, "Comparison of the Effectiveness of Pneumatic Sound Sources and Shots in Deep Seismic Sounding in the Ocean"]

[Abstract] Since 1971 high-power pneumatic sound sources (chamber volumes 14, 28, 30 and 60 liters) have been used by the Institute of Oceanology during deep seismic sounding with bottom seismographs. Crustal investigations were made under different seismogeological conditions: in the Black, Caspian, Baltic and Barents Seas, in the Pacific, Indian and Atlantic Oceans. It has been found that pneumatic sources with a chamber volume of 30 liters (at a pressure of 100 atm) have a stored energy equivalent to a TNT charge of about 180 g. The pneumatic sources are more effective seismically. In deep seismic sounding it is possible to obtain good records of deep waves at distances up to 35-45 km from the radiation point. For this reason in 1973 the Institute of Oceanology carried out a direct comparison of the effectiveness of TNT shots and pneumatic sound sources in the Black Sea and later, in 1975, in the Atlantic Ocean. These experimental comparisons are described in detail. Recommendations are given on the further use of pneumatic sound sources in work by the deep seismic sounding method in the sea. For example, a simple increase in chamber volume to 300 liters (TNT equivalent about 10 kg) would evidently not give a major increase in the depth of investigations and the technical difficulties in its use

would increase appreciably. The most promising improvement would be the grouping of two or three pneumatic sound sources with a chamber volume of 30-60 liters.
[95-5303]

CREATION OF DEEP-WATER AUTONOMOUS INSTRUMENTS FOR OCEAN INVESTIGATIONS

Moscow OKEANOLOGIYA in Russian Vol 19, No 5, 1979 pp 924-929

[Article by G. M. Lezgintsev, Ye. A. Kontar' and Ye. I. Garbuz, All-Union Scientific Research Design and Construction Institute of Mining for Non-ferrous Metallurgy, "Creating Deep-Water Autonomous Instruments for Investigations in the Ocean"]

[Abstract] Specialists in the USSR Nonferrous Metallurgy Ministry, during the years 1976-1979, created and tested, during five ocean expeditions at depths as great as 5,300 m, self-contained (autonomous) bottom samplers of two types -- the AP-6000 and the AP-passat. The tests revealed that with respect to technical indices they are superior to foreign dredges and in reliability are superior to them. Figure 1 shows photographs of the two models; Figures 2 and 3 are design diagrams and an illustration of how the apparatus functions; a table gives the technical specifications of each model. For example, in the case of the AP-6000, the measurements are 3800 x 550 x 280 mm, submergence depth is 6000 m, weight is 60 kg, the area from which the sample is taken is 0.3 m^2 , rate of vertical movement in the water is $1.1-1.5 \text{ m} \cdot \text{sec}^{-1}$. The accumulated data make it possible to propose further improvements. Plans call for creating the AP-passat A, intended for taking undisrupted bottom sediment samples, the AP-kal'mar and AT-6000, designed for taking core samples of bottom sediments, AB-6000 samplers for taking samples of water and also bottom metal-bearing suspensions and brines. A further objective is to have such equipment made from individual parts, making possible routine variation of the working parts and improvement in the design of individual components without radical redesigning of the apparatus as a whole.

[95-5303]

LONG NONLINEAR WAVES IN VARIABLE-DEPTH ROTATING OCEAN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 248, No 6, 1979 pp 1439-1442

[Article by A. B. Odulo, Institute of Oceanology, "Long Nonlinear Waves in a Rotating Ocean of Variable Depth"]

[Abstract] In earlier studies (D. H. Peregrine, J. FLUID MECH., Vol 27, 2, 815, 1967; R. S. Johnson, PROC. CAMBR. PHIL. SOC., Vol 73, 1, 183, 1973; A. E. Green, et al., J. FLUID MECH., Vol 78, 2, 237, 1976), on the basis of an

initial system of equations describing motion in a layer of an ideal incompressible fluid with a free surface, the authors derived simpler equations for nonlinear waves with small nonlinearity and dispersion. A. B. Odulo in this new study gives the derivation of equations describing the motion of long gently sloping waves in a rotating fluid of variable depth. In a plane case the problem is reduced to one equation without any assumption concerning the slowness of change in depth. The author has also derived an equation describing topographic Rossby waves.

[101-5303]

DISCRIMINATION OF BAROTROPIC COMPONENT IN PROBLEMS OF OCEAN DYNAMICS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 248, No 4, 1979 pp 836-839

[Article by Academician G. I. Marchuk and M. A. Bubnov, Computation Center, Siberian Department USSR Academy of Sciences, "Method for Discriminating the Barotropic Component in Problems of Ocean Dynamics"]

[Abstract] In an earlier study (CHISLENNOYE RESHENIYE ZADACH DINAMIKI ATMOSFERI I OKEANA (Numerical Solution of Problems in the Dynamics of the Atmosphere and Ocean)), Leningrad, Gidrometeoizdat, 1974) the author formulated a general approach to solution of problems in the dynamics of the ocean and atmosphere on the basis of discrimination of the barotropic component. This method proved to be extremely effective in the mathematical modeling of different problems in dynamics of the ocean (for example, see G. I. Marchuk, et al., IZV. AN SSSR, FIZ. ATM. I OKEANA, Vol 11, No 12, 1294, 1975). Now, in this paper, in the example of linearized problems, the author validates the use of this method for discriminating the barotropic component for finding an approximate solution and proof of the correctness of problems in the hydrothermodynamics of the ocean.

[83-5303]

GEOACOUSTIC CHARACTERISTICS OF BOTTOM SEDIMENTS IN INDIAN OCEAN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 249, No 1, 1979 pp 203-205

[Article by A. V. Il'in and V. A. Yemel'yanov, Acoustics Institute, "Geoacoustic Characteristics of Bottom Sediments in the Indian Ocean"]

[Abstract] A specialized geological-geophysical expedition operated in the northern part of the Indian Ocean during the period January-April 1979 aboard the "Akademik Vernadskiy." The program provided for study of the geoacoustic characteristics of bottom deposits -- the velocities of propagation of sound, density, moisture content, porosity and other physical properties. Measurements of the velocities of longitudinal waves in cores

of bottom sediments were made using an ultrasonic defectoscope. Investigation of the speed of sound and the physical properties of bottom sediments were made, as indicated by the map reproduced below, in the Somali Basin, Arabian Sea-Indian Ocean mid-oceanic ridge, Bay of Bengal and the central basin of the Indian Ocean.

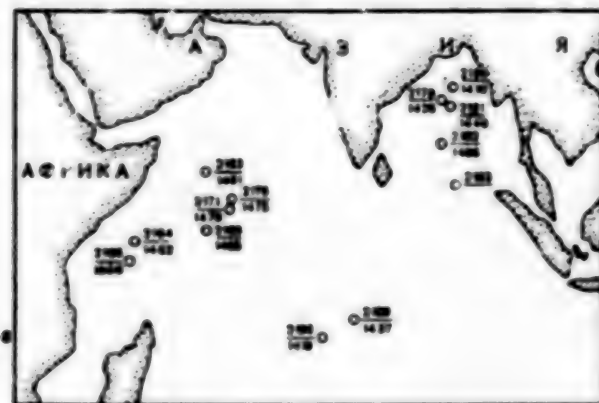


Figure. Map of the distribution of geological stations. The top figures indicate the numbers of the stations; the figures at the bottom give the speed of sound (m/sec) in bottom cores.

The most general property of all the studied bottom cores is an irregularity in the change in the speed of sound and other physical properties with depth. The changes in the speed of sound in individual cores with a length of 5-8 m can attain 100-120 m/sec and deviations from the mean statistical value are 50-60 m/sec. There are obvious interrelationships between the velocities of sound propagation and sedimentation rates. Bottom sediments with maximum speeds of sound are characteristic for regions with minimum rates of accumulation of sediments. Minimum speeds of sound are characteristic of regions with maximum sedimentation rates (thick accumulation of terrigenous deposits carried by the Ganges and Brahmaputra into the Bay of Bengal). The geoacoustic description of bottom deposits is one of the principal criteria for evaluating overall geoacoustic conditions on the ocean floor. The results of this expedition will make it possible to carry out regionalization of the upper layer of sediments on the basis of geoacoustic parameters. Such regionalization will be an important step in constructing a geoacoustic model of the floor of the Indian Ocean.

[84-5303]

II. TERRESTRIAL GEOPHYSICS

News

SUPERDEEP DRILLING PROJECTS TO BE EXPANDED

Moscow IZVESTIYA in Russian 16 Nov 79 p 6

[Article by N. Aranovskiy: "To the Secrets of the Depths"]

[Excerpts] "Uralmash-15000" drill rigs are operating in Azerbaydzhan, near the rayon center Saatly, and on the Kola Peninsula, not far from Zapolyarnyy city. The Kola drillers have really approached almost a 10-km drilling depth. What are the scientific and practical prospects which are being afforded in connection with the mastery of superdeep drilling? V. Rudoiskatel', Winner of the USSR State Prize, chief designer of the drill rig division of the "Uralmash" production combine, told about this in an interview with an IZVESTIYA correspondent.

Fifteen scientific research and design institutes of the country and enterprises of ten ministries participated in creation of the "Uralmash-15000" drill rig. This is an entire highly mechanized and automated plant which is serviced by 150-160 men. The height of the drill rig tower is 70 meters, equal to the height of a 20-story building.

Why was it that the sites selected for the superdeep drilling were specifically on the Kola Peninsula and in Azerbaydzhan? Geological investigations are being carried out in two directions: with respect to hard rocks (here the ore-forming process is studied) and with respect to soft rocks (in this case the petroleum-forming process is at the center of attention of operators). The Kola drill rig is for solving the first group of problems, whereas the Saatly superdeep hole is for solving the second group of problems.

By the end of the Tenth Five-Year Plan the Kola borehole will penetrate still deeper into the earth. And the closer to the earth's mantle, the more unwillingly will the planet allow such an unusual penetration, although the earth scarcely feels it.

In order to increase the rate of drilling, much must be re-examined and re-done; after all, we are proceeding on an unexplored path. For example, almost at the 10-km depth the temperature attains 160°, whereas it was supposed to be 90°, and the pressure exceeds a thousand atmospheres. Upon reaching the planned depth it is expected that these indices will increase to 300°

and 1,800 atmospheres respectively. However, time will tell.

In the immediate future in different regions of the country plans call for the drilling of several boreholes with a depth of 9-12 kilometers, including in the Urals. There is a version that the ancient Ural Mountains favored "runoff" into terrestrial lowlands and the formation of petroleum deposits: in the east -- into the area of Tyumenskiy Kray, and in the west -- into the Tataria and Bashkiria region. Evidently it is not superfluous to carry out sounding in northern and southern directions.

Experience in petroleum production has shown that the time has come to change over to drill rigs with a depth of penetration as great as eight kilometers. At the beginning of the Eleventh Five-Year Plan Uralmash specialists will proceed to the creation of such equipment.

[76-5303]

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III. ARCTIC AND ANTARCTIC RESEARCH

News

OTTO SHMIDT ON MAIDEN CRUISE TO ARCTIC

Moscow PRAVDA in Russian 21 Oct 79 p 3

[TASS Report: "A Scientific Research Ship in the Arctic"]

[Text] Murmansk, 20 October (TASS) — The world's first scientific research icebreaker, the "Otto Shmidt," which was built by shipbuilders of the Leningrad Admiralty Union, set out today on its first working cruise to the Arctic. It will conduct operations within the framework of a program calling for the study of remote areas of the Kara Sea.

The new research ship is equipped with the most modern navigational and laboratory instrumentation. A special shaft built into the hull of the ship makes it possible for scientists to conduct a large number of observations of sea water and the creatures inhabiting it without going out onto the ice. Also noteworthy is the fact that oceanographers, meteorologists and glaciologists on board the floating laboratory will conduct work in those parts of the Arctic Ocean where conventional ships of the hydrometeorological service have not yet cruised because of the ice conditions. Instrumentation installed on board the ship will allow these scientists not only to study the dynamics of the interaction between the ocean and the atmosphere, but also to obtain data on the movement of ice and the climate of the Arctic seas.

[57-0000]

ON COURSE TOWARD ANTARCTICA

Moscow PRAVDA in Russian 28 Oct 79 p 6

[Article by V. Bardin, Candidate of Geographical Sciences]

[Text] The vessels for the 25th Soviet Antarctic Expedition are now being loaded in Leningrad seaport. First to go, the "Olenek" diesel-electric ship was launched yesterday. In its holds it carries expeditionary equipment, provisions, fuel and means of transportation.

The "Olenek" diesel-electric ship will have to sail a long route to Antarctica waters, past the Canary Islands and South America. At the edge of the ice belt it will receive on board a group of polar explorers from the "Bashkiriya" diesel ship, which had reached Antarctica from Odessa somewhat earlier.

One of the main tasks to be performed by the "Olenek" crew is transporting the expeditionary personnel and freight to the region where the Druzhnaya seasonal base is located on the icy coast of the Weddell Sea. Access to it is often impeded by a heavy ice belt. Reaching it requires experience and ability to walk on Antarctic ice. Much help to the seamen will be satellite communication and ice condition forecasts coming regularly from the Molo-dezhnaya Meteorological Center. Many experienced seamen are sailing on the "Olenek" and its captain V. Ivanov has already been to Antarctica.

The "Pioner Estonii" dry-load freighter, the "Professor Vize" scientific research ship and the "Mikhail Somov" scientific expeditionary ship will follow the "Olenek" from Leningrad in November. The "Estoniya" diesel ship with the last group of explorers on the 25th expedition is, moreover, also scheduled to depart from Leningrad seaport at the beginning of next year.

The route of Soviet vessels will run almost completely around that southern continent. The "Mikhail Somov" faces a complicated task at the shores of Western Antarctica. Here Russkaya station should begin to operate in the Cape Berks region.

The plans for scientific research to be done during the 25th expedition are diverse and interesting. The expedition can, without doubt, be compared to a large complex institute whose staff is engaged in exploring the nature of the southern polar region.

At Mirnyy base for the study of environmental conditions there will be measurements of the concentrations of various pollutants in atmospheric precipitation (fallout) and in the ice crust.

Complex geological-geophysical and topographic-geodetic studies will be undertaken in the neighborhood of Druzhnaya base. The deep structure of the earth's crust in this region will be explored by use of seismic shots. A special team will search for meteorites.

Intensive ubiquitous explorations over Central Antarctica are in store for geophysicists and hydrologists, in accordance with several scientific programs such as the International Hydrological Project.

In the best tradition, members of the expedition will also include foreign experts from the German Democratic Republic, the Polish People's Republic, the United States and Japan.
[59-2415]

RESEARCH PROGRAM FOR 25TH ANTARCTIC EXPEDITION OUTLINED

Leningrad LENINGRADSKAYA PRAVDA in Russian 14 Oct 79 p 4

[Article by N. A. Kornilov]

[Excerpts] Another Soviet Antarctic Expedition, the 25th already, is now being prepared. It will be headed by the well-known polar explorer, Hero of Socialist Labor and Candidate of Geographical Sciences Nikolay Aleksandrovich Kornilov. In an interview with Yu. Stvolinskiy, correspondent of LENINGRADSKAYA PRAVDA, he told us: Our task is to continue complex research in the Molodezhnaya Meteorological Center, at Mirnyy Observatory, and at Vostok, Novolazarevskaya, Bellingshausen and Leningradskaya stations. The program of activities for the 25th Soviet Antarctic Expedition includes aerometeorological, geophysical, glaciological, hydrological, geodetic and other studies. For aerometeorological studies, from which more knowledge about the air circulation over Antarctica and the climate there is to be gained, we have prepared various means of exploration such as satellites and radar. This service unit of the expedition should provide aerometeorological data and weather forecasts to the ships sailing on southern seas.

For the second year now environmental conditions will be studied at Mirnyy Observatory. The task of measuring the ozone content in the atmosphere has been assigned to Mirnyy Observatory and Vostok station. Acquisition of scientific and practical data is one of the tasks before our geophysicists. Geophysical research is done at the Molodezhnaya Center and Mirnyy Observatory, as well as at Vostok and Novolazarevskaya stations.

Hydrometeorological exploration and studies of sea ice will be continued at the coastal stations in Antarctica. This activity should yield important information with which safe sailing of expeditionary vessels along the Antarctic coast and performance of loading operations can be ensured. At Vostok station and in Mirnyy region we will continue drilling the ice crust. The purpose is exploration of ice structure and the processes transpiring there.

The 25th Soviet Antarctic Expedition must do a huge amount of seasonal work. Construction of Russkaya station in the Coats Land coastal region is scheduled (this project was begun several years ago, but was never completed for winter habitation). At this station we plan to organize meteorological, actinometric and coastal ice exploration. The station personnel will consist of nine persons. With respect to seasonal work, one ought to mention Druzhnaya base on the southern coast of the Weddell Sea, where geological-geophysical research will be continued.

In addition to the trek to Vostok station, for carrying equipment to it, there will be three other treks along different routes for scientific purposes. Exploration in accordance with the International Glaciological Program and geomagnetic studies will be included. Radar measurements will be made during one of these treks for determining the rate at which the

the glacier surface cover moves.

The expeditionary vessels, including the "Professor Vize" scientific research vessel, will operate in the southern seas in accordance with the POLEKS-YuG program. This will include oceanological photography and aerometeorological measurements at the "divides" separating Africa from Antarctica and Africa from Australia respectively.

The fleet of the 25th Soviet Antarctic Expedition consists of six vessels: the "Mikhail Somov" diesel-electric ship, the "Professor Vize" scientific research vessel, the "Olenek" and the "Pioner Estonii" diesel freighters, the "Bashkiriya" and the "Estoniya" diesel passenger ships. Besides the crew, 554 persons will participate in the 25th Soviet Antarctic Expedition and 296 of them will remain there over the winter.
[58-2415]

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